

30. (New) A catalyst composition comprising the product
resulting from the combination of

a) a chromium catalyst having a pore volume of at least 1.8
g/cc and a surface area of at least 400 m²/g produced by contacting a
5 chromium-containing, titanium-containing, silica-containing solid with
carbon monoxide under conditions such that a substantial portion of the
chromium is in the divalent state, and

b) a cocatalyst selected from the group consisting of i) alkyl
lithium or aryl lithium compounds, ii) dialkyl aluminum alkoxides in
10 combination with at least one compound selected from the group consisting
of alkyl zinc compounds, alkyl aluminum compounds, and alkyl boron
compounds, and iii) mixtures thereof.

31. (New) A catalyst composition according to claim 30
wherein said cocatalyst comprises an alkyl lithium compound.

32. (New) A catalyst composition according to claim 31
wherein said alkyl lithium compound has 1 to 12 carbon atoms.

33. (New) A catalyst composition according to claim 31
wherein said alkyl lithium compound has 1 to 5 carbon atoms.

34. (New) A catalyst composition according to claim 33 wherein said alkyl lithium compound comprises n-butyl lithium.

35. (New) A catalyst composition according to claim 34 wherein the alkyl lithium compound is used in an amount so as to give an atom ratio of lithium metal to chromium metal in the range of about 0.5:1 to 10:1.

36. (New) A catalyst composition according to claim 34 wherein the chromium catalyst contains about 0.5 to about 5 weight percent chromium and about 0.1 to 7 weight percent titanium.

37. (New) A composition according to claim 30 wherein said lithium compound is used in an amount so as to give an atom ratio of lithium metal to active chromium catalyst component within a range of about 0.5:1 to about 10:1.

38. (New) A composition according to claim 30 wherein the chromium catalyst is prepared by calcining a chromium-containing, titanium-containing, silica-containing solid with oxygen at a temperature in the range of about 400 to about 900 degrees C to convert a substantial portion of the chromium to the hexavalent state and then contacting the calcined product with carbon monoxide at a temperature in the range of

about 300 to about 500 degrees C to convert a substantial portion of the chromium to the divalent state.

39. (New) A composition according to claim 30 wherein said cocatalyst is a dialkyl aluminum alkoxide in combination with at least one alkyl compound selected from the group consisting of alkyl zinc compounds, alkyl aluminum compounds, alkyl boron compounds, and mixtures thereof.

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40. (New) A composition according to claim 39 wherein said alkyl compound is an alkyl zinc compound.

41. (New) A composition according to claim 40 wherein said alkyl zinc compound is diethyl zinc.

42. (New) A composition according to claim 39 wherein said alkyl compound is an alkyl aluminum compound.

43. (New) A composition according to claim 42 wherein said alkyl aluminum compound is triethyl aluminum.

44. (New) A composition according to claim 39 wherein said alkyl compound is an alkyl boron compound.

45. (New) A composition according to claim 44 wherein said alkyl boron compound is triethylboron.

46. (New) A dual catalyst composition comprising:

1) a polymerization catalyst system comprising a chromium catalyst resulting from the combination of

a) a chromium catalyst having a pore volume of at least 1.8 g/cc and a surface area of at least 400 m²/g produced by contacting a chromium-containing, titanium-containing, silica-containing solid with carbon monoxide under conditions such that a substantial portion of the chromium is in the divalent state,

b) a cocatalyst selected from the group consisting of i) alkyl lithium or aryl lithium compounds, ii) dialkyl aluminum alkoxides in combination with at least one compound selected from the group consisting of alkyl zinc compounds, alkyl aluminum compounds, and alkyl boron compounds, and iii) mixtures thereof, and

c) a Ziegler-Natta catalyst composition produced by combining a halide of a metal selected from the group consisting of titanium, vanadium, and zirconium and an organoaluminum compound.

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47. (New) A catalyst composition according to claim 46 wherein the organoaluminum of the Ziegler-Natta catalyst composition comprises a triethylaluminum compound.

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Cont 48. (New) A polymerization process comprising contacting at least one mono-1-olefin under polymerization reaction conditions with a polymerization catalyst composition of claim 1.

49. (New) A process according to claim 48 wherein said mono-1-olefin has from about 2 to about 8 carbon atoms per molecule.

50. (New) A process according to claim 48 wherein said mono-1-olefin is selected from the group consisting of ethylene, propylene, 1-butene, 1-pentene, 1-hexene, 1-octene, and mixtures thereof.

51. (New) A process according to claim 48 wherein said mono-1-olefin is ethylene.

52. (New) A process according to claim 50 wherein a copolymer is produced by polymerizing ethylene and about 0.5 to about 20 mol percent of one or more comonomers selected from the group consisting of mono-1-olefins having from about 3 to about 8 carbon atoms per molecule.

53. (New) A process according to claim 52 wherein said comonomer is selected from the group consisting of propylene, 1-butene, 1-pentene, 1-hexene, 1-octene, 4-methyl-1-pentene, and mixtures thereof.

54. (New) A process according to claim 50 wherein said polymerization is carried out at a temperature within a range of about 66 to about 110°C.

55. (New) A process according to claim 48 wherein the catalyst composition consists essentially of the product resulting from the combination of

a) a chromium catalyst having a pore volume of at least 1.8 g/cc and a surface area of at least 400 m²/g produced by contacting a chromium-containing, titanium-containing, silica-containing solid with carbon monoxide under conditions such that a substantial portion of the chromium is in the divalent state, and

b) a cocatalyst selected from the group consisting of i) alkyl lithium or aryl lithium compounds, ii) dialkyl aluminum alkoxides in combination with at least one compound selected from the group consisting of alkyl zinc compounds, alkyl aluminum compounds, and alkyl boron compounds, and iii) mixtures thereof.

56. (New) A process according to claim 55 wherein ethylene is homopolymerized and the amount of cocatalyst is such that the polymer has a lower density than a polymer produced under the same conditions without the use of the cocatalyst.

57. (New) A process according to claim 56 wherein the cocatalyst consists essentially of n-butyl lithium.

58. (New) A process according to claim 56 wherein the cocatalyst consists essentially of dialkyl aluminum alkoxides in combination with at least one compound selected from the group consisting of alkyl zinc compounds, alkyl aluminum compounds, and alkyl boron compounds.

59. (New) A polymerization process comprising contacting at least one mono-1-olefin under polymerization reaction conditions with a dual polymerization catalyst system composition according to claim 46.

60. (New) A process according to claim 59 wherein ethylene is polymerized and wherein said chromium catalyst consists essentially of the product produced by combining

a) a chromium catalyst having a pore volume of at least 1.8 g/cc and a surface area of at least 400 m²/g produced by contacting a

chromium-containing, titanium-containing, silica-containing solid with
carbon monoxide under conditions such that a substantial portion of the
chromium is in the divalent state, and

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b) a cocatalyst selected from the group consisting of alkyl

10 lithium compounds.
